DOCUMENT RESUME

ED 406 132 SE 054 659

TITLE	Great Lakes: Great Gardening.
INSTITUTION	New York Sea Grant Inst., Albany, N.Y.
SPONS AGENCY	Cornell Univ., Ithaca, N.Y. Cooperative Extension Service.; Environmental Protection Agency, Washington, D. C.; National Oceanic and Atmospheric Administration (DOC), Rockville, Md. National Sea Grant Program.; State Univ. of New York, Albany. Research Foundation.
PUB DATE	Feb 93
CONTRACT	NA90AA-D-SG078-A/EEP-3
NOTE	33p.
AVAILABLE FROM	New York Sea Grant Program, 21 South Grove Street, East Aurora, NY 14052-2398 ($2; $1.25 for over 100 copies).
PUB TYPE	Guides - General (050)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Grounds Keepers; *Horticulture; Plant Propagation; *Soil Conservation; *Water Pollution
IDENTIFIERS	Gardening; *Gardens; *Great Lakes

ABSTRACT

This folder contains 12 fact sheets designed to improve the quality of gardens near the Great Lakes. The titles are: (1) "Your Garden and the Great Lakes"; (2) "Organic Gardening"; (3) "Fruit and Vegetable Gardening"; (4) "Composting Yard Wastes"; (5) "Herbicides and Water Quality"; (6) "Watering"; (7) "Soil Erosion by Water"; (8) "Soil Fertility"; (9) "Pest Management"; (10) "Landscaping"; (11) "Attracting Birds Naturally"; and (12) "Lawns." (MKR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 406 132

GREAT LAKES: GREAT GARDENING

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

E. George

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

SE054659

New York Sea Grant

A publication of The Research Foundation of State University of New York pursuant to National Oceanic and Atmospheric Administration Award No. NA90AA-D-SG078 A/EEP-3

Cornell Cooperative Extension

United States Environmental Protection Agency Region II

Fact Sheet # 1

Great Lakes: Great Gardening

Your Garden and the Great Lakes

Coastal Waters Are the Heart of Our Region

Water quality in any area affects the quality of your life. Industry, recreation, and even the wholesomeness of the fish you eat all depend on it. Streams, rivers, and storm drains are direct connections from your yard to Lake Ontario and Lake Erie. What you do in your yard contributes to clean or polluted coastal and groundwaters. *Great Lakes: Great Gardening* practices can improve water quality while helping you maintain a better garden.

Our Great Lakes Are in Trouble

Many areas of the Great Lakes suffer from past and present pollution. Efforts such as the federally sponsored Fish and Wildlife project are underway to clean up and protect Lakes Erie and Ontario.

We have long been aware of pollution from *point sources*, such as factories and sewage treatment plants. We have recently become more aware of the threat of *nonpoint source* pollution, such as storm water runoff. This is pollution created by many relatively small and widespread sources. By themselves, each of these sources may seem insignificant; but, added together they pose a serious threat.

Garden Practices Affect Water Quality

There are hundreds of thousands of homes with gardens in New York and Canada that potentially contribute runoff to Lakes Erie and Ontario. Each may contribute a relatively small amount of runoff containing soil, chemicals, and fertilizers. They add up to a sizable problem. Nonpoint source pollution will be

controlled only when individuals take responsibility and make wise choices.

REMEMBER

The key to *Great Lakes:Great Gardening* is to reduce the amount of potential contaminants, fertilizers, and pesticides introduced into the environment and to minimize the amount of water that runs off your property.

For more information about *Great Lakes:Great Gardening* for both a better garden and a cleaner Lake, call or visit your local Cooperative Extension office.

Artwork by Susan Stone

Printed on recycled paper

Everyone Lives in a Watershed

With each rain or snow, almost every square inch of the region contributes to the water flow into Lakes Erie and Ontario. Rivers, streams, groundwater, gutters, storm and sanitary sewer systems, hills and bottomlands are all part of the system.

Everyone Lives on a Stream

Whether our stream is a natural channel or a constructed one, such as a storm sewer, the effect is still the same. Eroding soil and the runoff or leaching of fertilizers and chemicals have an impact on our lakes, streams, bays, and the Great Lakes. Most storm sewer water drains into the Lakes or groundwater untreated. Even sewage treatment does not remove all pollutants.

Whatever is poured, spread, or sprayed on plants or the ground can find its way into the Lakes or groundwater. Just because a problem flows away from the property does not mean it is eliminated.

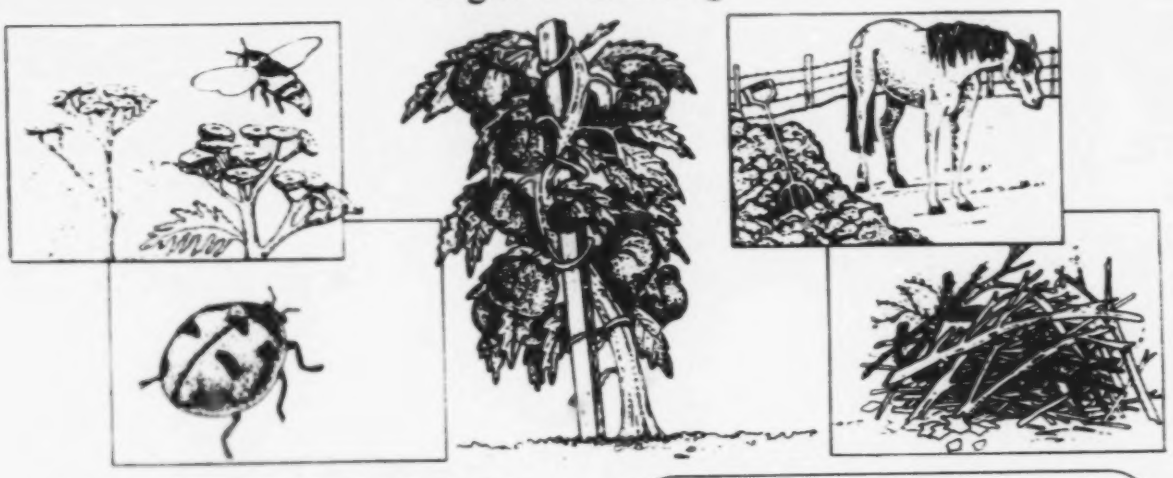
Great Lakes:Great Gardening

This is a program to integrate good gardening practices with good water quality practices. The same simple, practical techniques that improve the soil, beautify the landscape, and reduce maintenance time and cost can also protect the quality of our water and the Great Lakes. *Great Lakes:Great Gardening* not only can add to the value of your property and the pleasure derived from it, but also contribute to a cleaner Lake Erie and Lake Ontario.

Great Lakes: Great Gardening

Fact Sheet # 2

Organic Gardening



In a time of increasing awareness of ecological problems, organic gardening has engaged the attention of home gardeners -- as a way of addressing both health and environmental concerns. Organic gardening practices are quite simply good gardening practices. Our efforts to rebuild soil and handle insect and disease problems in the least toxic way are not only the "right thing to do" but also produce successful flower and vegetable gardens, and lawns. The homeowner's choices about lawn care and gardening techniques do have significant impact on soil, water, and wildlife. The average homeowner uses up to 10 times more chemicals per acre than farmers, so the organic route is appropriate to consider in our own backyards.

Protect Soil Structure

Soil provides the basis for healthy plants and gardeners spend much time building soil. Soil is composed of about 25% air, 25% water, and 50% organic matter, minerals, and living organisms. Protect the soil. First, STOP--DON'T STEP ON THE SOIL. Soil compaction ruins the structure and the living elements in soil, and takes years to correct. To avoid this problem, improve garden layout and tilling practices. Raised beds are a fine technique, whether enclosed in boards or stone or simply formed by hoe or rake. Maintain permanent paths and practice shallow tilling to help soil structure and reduce the likelihood of stirring up dormant weed seeds. Ideal organic gardens consists of soil that is fluffy with organic matter, is kept permanently mulched, has permanent paths so that soil is never compacted, and needs no tilling.

Organic gardening principles for *Great Lakes Gardening* include three elements:

- **Rebuild the Soil:** Using soil without rebuilding it leads to poor soil structure, erosion, poor fertility, and added expenses for topsoil and fertilizers. Organic gardeners solve most soil problems by constantly adding organic matter, including compost, grass or leaves, garden or kitchen waste, manure, newspaper, or green manures.

- **Use No Pesticides:** Organic gardeners do not use herbicides or insecticides (with the possible exceptions of some botanical poisons or sulfur- or copper-based fungicides.) Reasons for pesticide avoidance include concerns for groundwater, the health of birds and other animals, food contamination, and protection of beneficial insects which are an integral part of organic pest control.

- **Use No Synthetic Fertilizers:** Most organic gardeners avoid synthetic fertilizers because of the concern for residual chemicals (salts), their effect on plant growth, and their negative effect on earthworms and other microbial life.

Add Organic Matter

Organic matter added to the soil helps improve soil structure, increases the soil's ability to hold air and water, and helps drainage. Organic matter also provides a home for helpful microorganisms and earthworms. Ideal soil consists of 20-25% humus (decomposed organic matter), achieved by adding 6 in. of organic matter per year. You may use any of the following:

- **Compost** is the best single additive, as it offers all the benefits of organic matter in a decomposed form that plants can use --plus it has the additional ability to help fight some soil-borne diseases. Composting helps the environment too, by using up kitchen and yard waste that might have been landfilled.

- **Kitchen scraps** including eggshells, coffee grounds, tea leaves, and chopped fruit and vegetable scraps can be added through compost or directly into the soil. (Exceptions are meat or fatty products). One method of adding these is called *trench composting*--putting the collected scraps directly into the vegetable or flower garden, into holes or trenches, and covering with 6 inches of soil.

- **Leaves, twigs and grass** can be added directly to garden soil , either by digging in or by *sheet composting*--spreading leaves or grass clippings on exposed soil as mulch, to block weeds and retain soil moisture during the growing season and to decompose during the winter.

- **Newspaper,** as well as computer paper, can be shredded into the compost or directly into the soil to improve texture, aeration, or tilth, and to attract earthworms. Newspaper sheets are also an effective mulch for blocking weeds early in the season, and will later decompose. Avoid shiny magazine--style papers.

- **Animal manures:** Horse, cow, pig, poultry, or other animal manures are excellent organic material to add to any garden, but should be aged before direct contact with plants. Horse manure especially contains many weed seeds, so mulch thoroughly or compost it before adding to soil. Animal manures mixed with bedding (straw, sawdust, etc.) are ideal for composting or spreading in the fall. Cat and dog wastes are not recommended.

- **Wood ashes** may be used in small amounts, with the warning that wood ashes -- also known as potash -- raise pH, causing the garden or lawn to become too alkaline.

- **Wood chips and sawdust** are best used as mulch or in an overly nitrogenous compost. While organic, these high carbon substances decompose too slowly to use directly in the soil (tying up nitrogen for too long during decomposition).

- **Green manures or cover crops** are often underutilized by home gardeners. A very efficient way to block weeds, enrich the soil, prevent erosion, attract beneficial insects, and prevent compaction is to plant a cover crop in fall or whenever soil is bare. Choices include the nitrogen fixing legumes such as alfalfa, peas, and beans particularly effective during the warmer months and the grains or grasses such as buckwheat, annual rye, winter rye, and red or yellow clover. A variation on the practice is *intercropping*, in which a cover crop is used among other plants to block weeds, enrich soil.

- **Black plastic,** while neither organic nor soil enhancing is often useful as a heat-attracting mulch which also retains moisture and kills weeds (especially when starting a new bed).

Improve Soil Fertility

A healthy soil contains all the minerals, organic matter, and microorganisms required to provide nutrients in a form that plants can use. Plants need nitrogen (N), phosphorus (P), potassium (K), calcium, magnesium, sulfur, and some minor nutrients, all of which are provided naturally as minerals in the soil or through the decomposition of organic matter. This decomposition is carried out by microorganisms, insects, and earthworms. Our work as organic gardeners is to provide a healthful environment for these creatures in the soil.

BEST COPY AVAILABLE

This means that corrective measures or additional fertilization are rarely needed.

In case of a nutrient deficiency, organic gardeners do not choose synthetic fertilizers as the solution. Studies have found fewer earthworms present in soil fertilized with standard N-P-K synthetic fertilizers. Another reason is the concern for residual salts or chemicals reaching streams or groundwater. Organic gardeners also avoid the quick-release, nitrogen-rich fertilizers especially because they tend to allow for "lazy" plants with poor root systems and weak top growth. This holds true for lawns as well, since overfed grasses have no need for roots to penetrate the soil in search of nutrients. The result is a lawn full of weak plants and frequently thatch build-up.

Organic fertilizers include manure, cottonseed meal, milorganite, and blood meal, all higher in slow-release nitrogen, and the high-phosphorus fertilizers such as rock phosphate (slow-release) and fish emulsion (quick-release). Other fertilizers are available to meet particular deficiencies, but a garden continually enriched with organic matter is likely to be well-balanced and fertile.

Earthworms are the best source of soil fertility, adding typically 1/3 lb. of balanced N-P-K fertilizer per worm per year. In addition, earthworms aerate the soil, provide drainage, and decompose organic matter, including thatch. Gardeners can increase the worm population by increasing organic soil content, using fewer chemicals, tilling less or not at all, tilling shallower or when earthworms are less active (later in fall, earlier in spring.)

Prevent Insect Pest Problems

Insects are easily handled through prevention rather than waiting for a large infestation. More than other gardeners, organic gardeners need to know the potential pests, their life cycles, and natural predators in order to work with nature for a healthy garden. The optimum condition is a yard or garden teeming with life: animals, birds, snakes, toads, insects, flowers, and crops all dependent on and complementary of one another. In fact, a minimum number of garden "pests" -- potato bugs, aphids, caterpillars, etc. -- are actually desired in such a scheme, as they provide enough food to lure and maintain a population of their natural predators. When a pesticide is used, insect predators are usually killed along with the target insect, so that future infestations have no natural predator and the cycle of spraying must be perpetuated.

Organic gardeners preventive measures include the following:

- **Row covers** are cloths that cover such crops as brassicas or cole crops to prevent egglaying or insect attack (i.e., cabbage moths leading to worms on broccoli.) Note: covers are removed for those plants that need pollination.

- **Cutworm collars**--made of paper, tin foil, plastic, cans, or cups -- protect young transplants from cutworm destruction.

- **Sticky traps and chemical lures,** sometimes used in combination, contain pheromones (sex hormones). Food lures can also be used to attract and trap pests, such as the apple maggot or Japanese beetle. Note: placement is critical, as Japanese beetle traps can in fact lure a large population to your garden if placed too close!

- **Timing** of plantings can be planned to minimize the damage of certain pests. For example, carrot maggots may be prevented by planting carrots in June rather than earlier, to avoid the insect's egg laying and emergence cycle. Knowledge is the key to success in this area.

- **Sanitation** is just good garden practice. Fall clean-up prevents the overwintering of insects, diseases, and weed seeds. Destroy, rather than compost, plants that were diseased or infested. In spring and summer, practice regular inspection, and hand-pick pests or destroy infected plants early.

Rotate Crops to Prevent Disease

In the home vegetable garden, crop rotation is important for replenishing soil nutrients and preventing disease. One approach is to rotate heavy and light "feeders" with cover crops (i.e.,corn, leafy vegetables, clover). Another choice, particularly when there has been a problem, is to rotate plant groups according to susceptibility to various insects or diseases (i.e., do not plant nightshade family members in the same spot year after year). Other rotational plans involve soil pH and various plant needs, so that potatoes, which like acid soil, are grown before the soil is limed (which raises pH) in preparation for another crop.

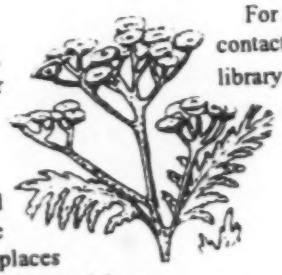
Use Companion Planting and Beneficial Insects

Some plants - herbs, flowers, vegetables - work well together for a variety of reasons, and organic gardeners

take advantage of this compatibility, particularly when it helps with pest control. Some plants repel pests and others attract, house, or feed the beneficial insects. There are some structural and physical reasons for companion plantings as well. For example, it's a good idea to plant tall plants next to shade-lovers (broccoli/lettuce), deep-rooted plants next to shallow roots (carrots/lettuce), bulbs at different depths for sequential bloom (tulips/scilla), or climbing plants leaning on tall supporting ones (pole beans/corn).

To repel insects, the onion/garlic/chives group is often used, and is especially good in deterring aphids or destructive beetles. Herbs planted among vegetables are effective as repellents and confuse pests by scent. Tests have shown that some specific vegetable interplantings (such as beans with potatoes) help prevent attacks by insects such as the Mexican bean beetles and Colorado potato beetles. Avoid monocropping, and vary your plantings to help prevent a large pest onslaught.

Beneficial insects need certain flowers and herbs for shelter or food, and water if they are to remain in our gardens to prey upon pests. Some helpful plants include tansy, Queen Anne's lace, parsley, dill, yarrow, buckwheat, nasturtiums, and members of the daisy family. These provide nectar, breeding and hiding places for insects such as spiders, ground beetles, ladybugs, lacewings, syrphid or hover flies, braconid or parasitic wasps, and many others. Generally, maintaining a continuous flowering throughout the garden -- of both daisy - shaped and lacy flowers -- plus a ground-level water dish greatly encourages beneficial insects.



Help Wildlife to Help the Garden

In addition to our earthworm and insect helpers, many animals provide pest control as well, especially toads, bats, birds, snakes, and lizards. Even skunks and moles eat huge numbers of grubs and larvae (but may cause other problems). A bat can eat 1,000 mosquitoes in one night, so a bat house is a great investment. Providing water and food for birds in summer as well as winter is a smart way to reduce insect pest populations. Toads will remain near the garden if you offer water (in low dishes) and "houses" (inverted clay pots with chipped edges for entry). Snakes will be encouraged by piles of stones or wood. Generally, attracting a natural balance of insect, bird, and animal life to your yard will result in fewer insect pests and a rich and interesting environment.

For additional information on organic gardening contact your local Cooperative Extension office, your library, or Rodale Press.

Artwork by Susan Stone

Printed on recycled paper.

Written by: Sally Cunningham

Fact Sheet # 3

Great Lakes: Great Gardening

Fruit and Vegetable Gardening

Gardens Are a Wonderful Source of Food

We all enjoy fresh garden-grown fruits and vegetables. By using *Great Lakes Gardening* techniques, it is possible to produce top-quality crops, while maintaining soil fertility and protecting our natural waters.

The *Great Lakes Gardening* approach to fruit and vegetable gardening is to select disease resistant species and properly plant them in well - prepared sites, and minimize the use of chemicals.

Where to Plant

To get the most out of a garden, it is important to choose the right site. It should have a minimum of six hours of direct sunlight, have well drained soil and be away from shade-casting trees. Plant the garden on level ground, avoiding sloping areas which are likely to erode.

If the garden has to be on an incline, plant across the slope so that each row acts as a ridge to trap rainfall, reducing soil erosion.

What to Plant

Fruit and vegetable plants need adequate sunlight, moisture, space, air, soil temperature, pH, and fertility. A plant living in less than optimum conditio s will not be as healthy as a plant growing under ideal conditions. Selecting varieties suited to your area and caring for them properly means better plant health and reduced maintenance. Check with a Cooperative Extension office for a list of recommended varieties. Healthier plants mean:

- more food from the garden
- less garden work
- less reliance on pesticides to deal with insects and diseases that take advantage of weak plants
- less potential for pollution and erosion

Garden Care

Watering

Water only when needed. Vegetable garden soil should be kept evenly moist. If nature does not provide 1 in. of rainfall per week, supplement with a single application during a seven - day period.

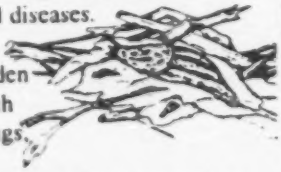
Some vegetable crops are naturally more deep-rooted and drought-tolerant than others. Generally, leafy crops, the nightshade family, and onion family crops will need the most frequent watering. Root vegetables should also be kept evenly moist (no wet-dry fluctuation) to prevent woody roots. The application of mulching materials will reduce the need for additional water. Seeds and seedlings in the germination/establishment phase require more frequent watering, as they need moisture closer to the surface.

Small fruits, such as blueberries, strawberries, and raspberries, need adequate moisture (1 in. per week) at all times during the growing season. Full size fruit trees require less watering than dwarf fruit trees.

Pests

Serious pest problems can usually be avoided by properly siting, planting, and maintaining the garden. The following preventative measures will reduce the chance of pest invasion:

- Choose healthy vegetable transplants and disease- resistant fruit and vegetable varieties.
- Rotate crops when practical so that the same or a related crop is not in the same place year after year. Repeated plantings of the same plants in the same spot can encourage insect infestation and the build-up of soil diseases.
- Practice good garden sanitation. Weeds, garden debris, and other rubbish may harbor insects, slugs, and diseases.



- Weed out volunteer vegetable seedlings such as tomatoes and squash as they compete with desired crops for water, space, and nutrients.
- Time vegetable plantings to avoid peak insect infestations. Record when insect problems appear so you can plan future plantings.
- Inspect plants for insects and eggs frequently. Pick off and destroy any you find.
- Dislodge insects with frequent sprays of water. This may be all the control you need for aphids, whiteflies, two-spotted mites and spittle bugs.
- Construct insect barriers over vegetable plants. Use screening or floating row covers (remove covers for insect - pollinated plants when flowers appear).
- Protect fruit crops from birds with netting.
- Properly train and prune fruit trees to help reduce disease and insect problems.
- Monitor for slugs by trapping in containers of beer. They can also be lured beneath boards for capture.
- Keep the garden free of debris to limit hiding and breeding places for pests.
- Mulch around fruit and vegetable plants to keep weeds down, add organic matter to the soil and reduce evaporation. Pull all weeds by hand before they get large. Herbicides are unnecessary in a vegetable garden.
- Use the least toxic control method. Some of these might include *Bacillus thuringiensis*, insecticidal soaps, and horticultural oil.

Fertilizer

Fertilizers supplement the nutrients already in the soil. Many gardeners apply too much, which may damage plants, endanger water quality, and waste money. When preparing the ground for vegetables in the spring, incorporate limestone (according to a soil test) and 1 to 2 lbs. of granular fertilizer per 100 sq. ft. When using chemical fertilizers on established plants, apply in bands along rows of seeded vegetables or in a circle around each plant. This improves yield and reduces the use of fertilizer.

Complete chemical fertilizers containing nitrogen, phosphorus, and potassium in the ratios of 10-10-10 or 5-10-10 are the easiest and least expensive to use. They are readily available for plant uptake during the period of cool soil temperatures in the spring. However, organic sources of nutrients, such as cottonseed, bone and blood meal, manures, compost, fish extract, and other organic materials, are available and may be used. As the percentage of nutrients in organic material is relatively low compared to chemical fertilizers, fairly large amounts may be required to supply plant needs.

REMEMBER

- Locate the garden where it is sunny and level.
- Plant disease-resistant, locally adapted varieties.
- Water only when needed.
- Use the least toxic pest control methods.

For more information about *Great Lakes:Great Gardening*, call your local Cooperative Extension.

Artwork by Susan Stone Printed on recycled paper

BEST COPY AVAILABLE

Fact Sheet # 4

Great Lakes: Great Gardening

Composting Yard Wastes

A Valuable Resource

Gardening creates wastes (vegetable garden debris, leaves, twigs and branches, etc.) that can be converted by composting into a valuable resource.

The *Great Lakes Gardening* approach to garden and yard wastes is to compost them and reuse the end product as a soil amender. Compost provides organic matter and valuable nutrients for many of your fertilizer needs.

Keep Yard Wastes Out of the Great Lakes

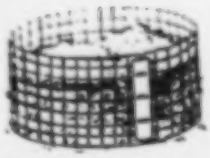
Dumping of these valuable and recyclable materials in Lakes Erie and Ontario or a river, lake, stream, storm drain, or recharge basin endangers the health of the water, the plants and animals associated with the water systems, as well as our own fresh water supply.

Using Yard Wastes

Mulching

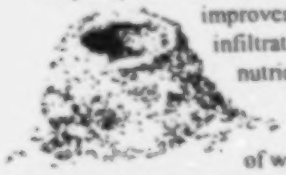
Yard wastes such as leaves and wood chips can be used as a mulch. Adding mulch to your garden will

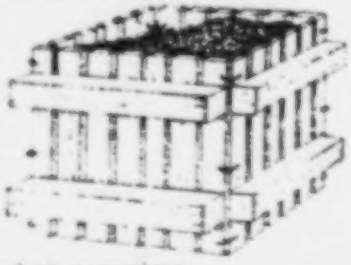
conserve water, moderate soil temperature, and reduce weed growth. Eventually, nutrients within the mulch will be released, and the decomposed organic matter will improve soil structure. Grass clippings are best left on the lawn to recycle their plant nutrients directly back into the growing grass. Improved recycling lawnmowers are available to assist this process. **Clippings do not contribute to thatch problems.**



Composting

Compost, the end product of organic decomposition, can be used to improve the soil. Compost can loosen heavy clay soils by improving soil structure. This improves aeration and water infiltration. In sandy soils, water and nutrient--holding ability will be increased (1 lb. of organic matter can hold up to 7 lbs. of water). The organic matter and its microbial populations will increase the soil's ability to hold and break down certain groups of pesticides. Soils rich in organic matter also provide a favorable environment for many beneficial organisms, such as insects, worms,and microorganisms.





Partially decomposed compost can be used as a surface mulch to control weeds. However, when it is tilled into the soil prior to planting, it should be completely decomposed.

What can be composted? All organic materials are compostable. Large pieces (twigs, branches, stalks, etc.) should be chipped or shredded to smaller pieces to speed up the breakdown process. Shredding leaves is also a good idea; a rotary mower could be used for this.

Herbicide --treated grass clippings, if collected, must be composted until completely decomposed (possibly up to a year) to eliminate potential secondary herbicide problems.

Diseased plant parts, as well as perennial weeds and weeds with seeds, should not be placed in a compost pile unless a large amount of organic matter is to be added at the same time. A large pile of properly managed decomposing biomass can provide high enough temperatures to kill many types of organisms.

A properly maintained compost pile will be odorless and free of pests and rodents.

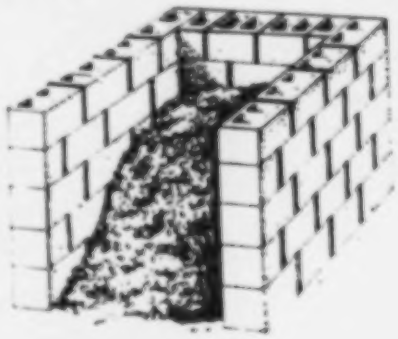
REMEMBER

- Yard wastes are a valuable recyclable resource that can improve the immediate surroundings without damaging any part of the environment.
- Using composted wastes to help improve soil will help with plant establishment and decrease soil erosion.

For more information about *Great Lakes:Great Gardening* for both a better garden and a cleaner Lake, call or visit your local Cooperative Extension office.

Artwork by Susan Stone

Printed on recycled paper



Great Lakes: Great Gardening

Fact Sheet # 5

Herbicides and Water Quality

The *Great Lakes Gardening* approach to herbicides is to use alternative weed control measures whenever possible and to minimize applications of pesticides by accurately identifying the target, using only what is needed at the proper time and in correct amounts.

Caution Is Required With all Herbicides

Almost all pesticides (including herbicides) can be damaging if they are not used exactly as their labels state. Improper application or spills may not only damage desirable plants but can be harmful to birds, bees, fish, beneficial insects, and ultimately animals, including humans.

Everyone gardens over groundwater and lives on a stream, whether there is one flowing through the backyard or not. Water which flows off your property is carried into drainage ditches or storm sewers. The water eventually flows into Lakes Erie and Ontario. It is the duty of all gardeners to make choices that are the least harmful to our waters.

BEST COPY AVAILABLE

Potential to Pollute

Whether an herbicide has the potential to find its way into ground or surface water is dependent on a number of factors: the chemical's solubility (whether it readily dissolves in water); its adsorptive qualities (how tightly it can bind to clay and humus particles in the soil); and its degradation (how fast soil microbes or other factors break it down into harmless components). Other factors that influence an herbicide's effectiveness are:

- soil texture (sand, silt, clay, and organic matter content)
- slope or grade of the land where it is used
- the proximity of the groundwater to the soil surface
- the presence and depth of hardpans and other impermeable layers
- amount and timing of rainfall or irrigation following application

Finally, human behavior greatly affects whether any chemical has the potential to pollute. As every herbicide is developed to solve specific weed problems, the homeowner must take care to use the right chemical (if any) for the target and to strictly follow all label instructions. Check with your local Cooperative Extension office for advice on organic alternatives to herbicide use, lawn care without pesticides, and herbicides recommended for specific problems.

Alternative Weed Control

Before choosing an herbicide, the homeowner or gardener has several less toxic alternatives to consider. In the case of lawns, a well-chosen turfgrass in fertile, highly organic soil, kept tall by mowing 3-3 1/2 in., will effectively block most weeds. Hand pulling or spot treating the encroachers is often sufficient. Further, a healthy, thick lawn prevents water runoff and erosion.

Flower and vegetable gardeners can control weeds using mulch -- from newspaper or black plastic to wood chips, straw, pine needles, leaves, or grass clippings. In larger plots, intercropping with such cover crops as clover may be suitable, and proper tilling (shallow tilling, twice in both spring and fall) decreases weed emergence. Solarizing (using clear plastic to encourage growth of weeds until they die) the soil is also effective.

Finally, new developments in weed control include using safe, soap-based herbicides, companion planting, and allelopathy (the study of plants that have adverse effects on the growth of other plants), and recently developed weedicides. The Erie County Cooperative Extension Office can offer additional information on organic choices, including mulches and weed management.

REMEMBER

- Apply herbicides only when absolutely necessary.
- Herbicide choices can impact water quality.
- Good garden and lawn maintenance minimizes the need for herbicides.
- A dense lawn will prevent runoff.
- Proper application rates and timing will improve the herbicides effectiveness and protect water quality.

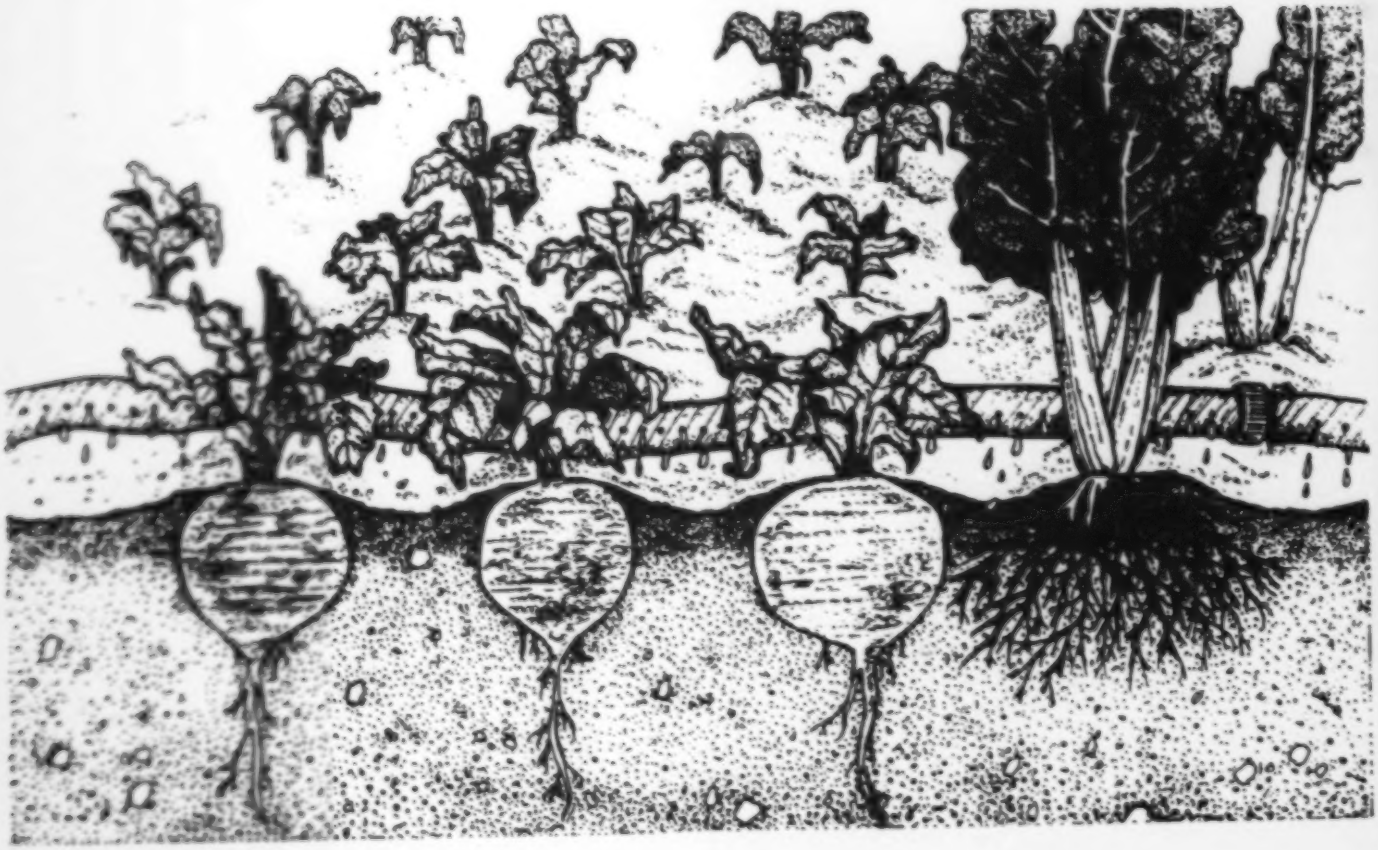
Artwork by Susan Stone

Printed on recycled paper

Great Lakes: Great Gardening

Fact Sheet # 6

Watering



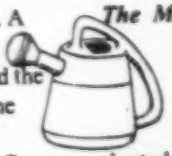
Plants Need Water

Proper watering is essential to a healthy garden. A plant is 75 - 90% water. Water is necessary for all internal plant functions such as photosynthesis and the transportation of nutrients. If water is applied at the proper times in correct amounts, it is possible to conserve it, thereby protecting water quality in the Great Lakes.

Overwatering can wash away soil, chemicals, and plant nutrients. They can find their way into rivers, bays, and Lakes Erie and Ontario -- a loss to the garden and a hazard to aquatic life.

The *Great Lakes Gardening* approach to watering is to plant drought-resistant species, landscape using xeriscape principles (planned, drought-resistant landscapes) and water when needed.

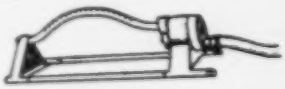
The Method Can Make a Difference.



Water Can or Garden Hose

This method is only appropriate for containers, small flower beds, newly planted trees, shrubs, or recently - sown flower or vegetable seeds. A small garden will require a great deal of time and patience to hand water properly. Sinking perforated plastic jugs into the ground next to plants will encourage infiltration. Using mulch will keep the soil moist and cool in the heat of summer.

Sprinklers



Keep the water pattern even by moving the sprinkler frequently and overlapping about one - half of each pattern. Place oscillating sprinklers higher than the plants to prevent water from

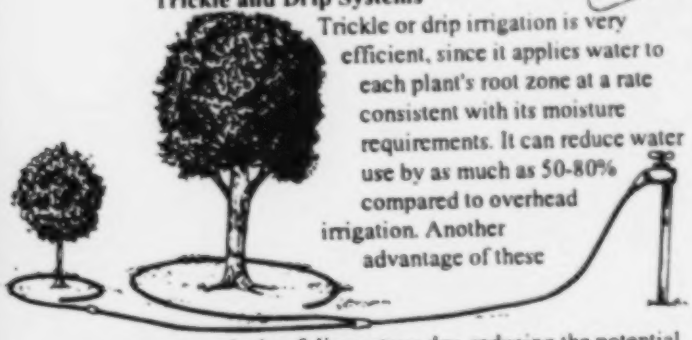
BEST COPY AVAILABLE

being diverted by plant leaves. Do not apply water faster than the soil can absorb it. Be sure the sprinkler is not watering the sidewalk, street, or other paved surface.

Soaker Hoses

There are a variety of special soaker hoses available. These can reduce runoff and evaporative losses and generally do not cost more than normal garden hoses. Perforated plastic hoses or soaker hoses should be placed with holes facing downward along one side of the crop row or underneath mulch. Water will slowly soak into the soil without wetting foliage, thus decreasing evaporation and the risk of foliage diseases.

Trickle and Drip Systems



Trickle or drip irrigation is very efficient, since it applies water to each plant's root zone at a rate consistent with its moisture requirements. It can reduce water use by as much as 50-80% compared to overhead irrigation. Another advantage of these systems is that foliage stays dry, reducing the potential for foliage disease problems.

When to Water

It is best to water early in the morning, and then, water only when needed. A good rule of thumb in watering plants is to fill the entire root zone and then allow the soil to partially dry out before the next irrigation. The speed of drying depends on the plant size and species, the ability of the soil to hold water, and the weather.

A small or newly - established plant will need watering before very much soil drying takes place generally within a few days to one week. Since seeds and seedlings should never be allowed to dry, they need more frequent watering. A vegetable garden should be watered when the soil within 1 in. of the surface feels dry to the touch. When a lawn gets too dry, it shows a loss of resilience; footprints will remain visible in the grass, and its color will change to a grayish hue.

Once plants are established, less frequent, deep watering with dry periods between will encourage deep roots. Gradually extend the length of time between waterings.

Do not rely on automatic timers. If using an automatic system, install a moisture sensor to turn it on and off. Also, do not water on windy days or during the heat of the day, especially with sprinklers, when considerable water may be lost to evaporation. Early morning watering is best for lawns and most other plants.

How Much Water to Use

A running hose can deliver about 375 gals. in one hour. Too much water, especially in poorly drained soils, can be damaging. Apply water only as fast as the soil can absorb it. Turn off water at the first sign of puddling; turn it back on later if water did not penetrate the whole root zone. Do not apply water at rates greater than 1/4 in. to 1/2 in. per hour; faster watering can cause runoff and/or erosion. Use small containers to measure the amount of water being applied. A lawn can use 1 in. to 1 1/2 in. of water per week during hot dry weather.

How to Reduce the Need for Water

- Select low -water use plants.
- Add organic matter to the soil to increase the water - holding capacity of sandy soils and allow for better air and water movement in compacted soils.
- Design the landscape around sound xeriscape principles -- consolidating plants requiring similar amounts of irrigation. Azaleas and rhododendrons could be grouped in one area; junipers and potentilla in another.
- Select a turfgrass that excels in low -water conditions.
- Mulch the tilled areas to help reduce evaporation of water.

REMEMBER

- Water deeply and slowly.
- Water when needed, not according to a pre-determined schedule.
- Water only as fast as it can be absorbed by the soil.
- Follow watering restrictions when and where they exist.

For more information on *Great Lakes:Great Gardening* contact your local Cooperative Extension office.

Artwork by Susan Stone

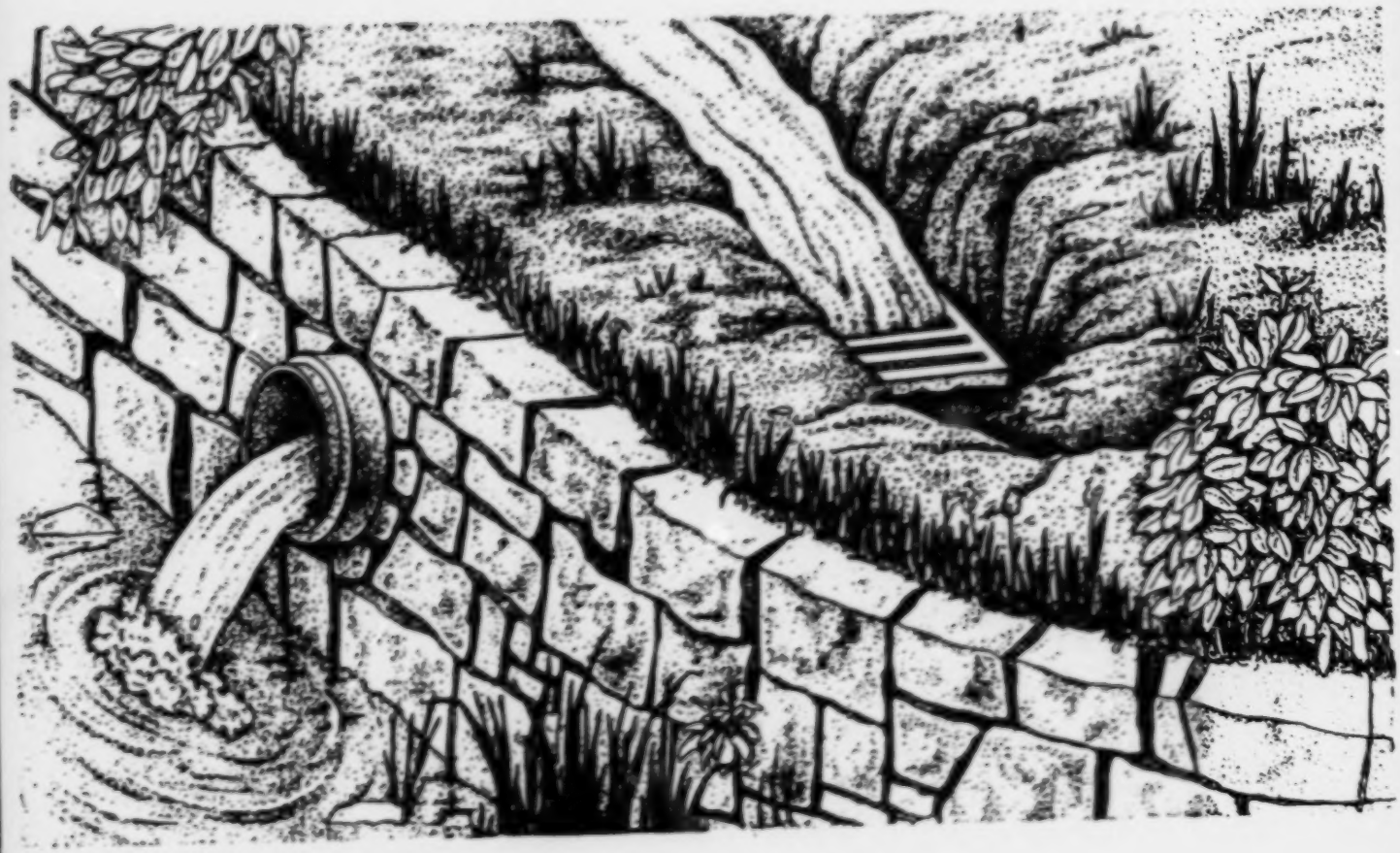
Printed on recycled paper

Great Lakes:Great Gardening was made possible through the combined efforts of the Sea Grant Programs of New York and Connecticut, Cornell Cooperative Extension of Erie, Nassau, Suffolk, and Westchester counties.

Great Lakes: Great Gardening

Fact Sheet # 7

Soil Erosion by Water



Erosion Hurts Your Garden and the Great Lakes

Driving rain and rushing water can carry away soil particles, organic matter, plant nutrients, and pesticides. This water-soil-chemical mix finds its way to ponds, recharge basins, streams, storm sewers, and ultimately Lakes Erie and Ontario. Fine soil particles cause cloudiness in natural waters, and excess nutrients may cause unnatural and ecologically disastrous blooms of algae. Pesticides, even in small quantities, may affect the health of fish and those who eat them.

Great Lakes:Great Gardening practices can help you control soil erosion and improve water quality.

The *Great Lakes Gardening* approach is to prevent soil erosion, thereby reducing runoff and contamination of Lakes Erie and Ontario by:

- planting ground covers, shrubs and trees to promote infiltration of water
- covering bare areas as soon as possible
- directing water across vegetated areas to promote infiltration

The Susceptibility to Soil Erosion

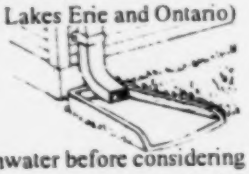
Soil Erosion Depends On:

Soil cover-- type and percent of coverage;
Soil type -- t he most erosion prone soils are silty or sandy;
Grade -- Sloping areas are more likely to erode.

How to Spot Erosion

A gully is obvious evidence of soil erosion. Not all erosion is this easily recognized. Look around for these other signs:

- muddy or cloudy water in the driveway, roadway, or gutter following rain or watering
- bare spots in lawns
- newly exposed tree roots (however, some species, such as maple, grow this way naturally)
- small stones or rocks appearing where none were before
- small rills or gullies beginning to show
- deposits of fine soils, usually in low - lying areas
- soil splashed on windows and outside walls
- widening or deepening of stream channels
- fallen trees in stream channels
- cloudy or muddy appearance of surface water bodies (ponds, lakes, Lakes Erie and Ontario)



Prevention and Remedies

Redirect Water

Observe the flow of stormwater before considering vegetative control of erosion. Large amounts of soil can be carried by water as it gains speed on a slope. Structural means of redirecting water may be necessary when slopes are steep and erosion is severe. Diversions placed atop a slope or terracing throughout will slow the water, reduce erosion, and allow for plant establishment. Professional advice may be necessary where land value is high or damage to property or life is possible.

Cover the Soil

Bare soil is the primary source of erosion. Reestablish vegetation as soon as possible wherever soil is exposed. Grass clippings, straw, or any other temporary cover will reduce erosion until permanent vegetation can be established. In heavy traffic areas, where plants cannot be used, a permanent mulch of stone, bark, or woodchips may be the only answer.

Protect Vegetation

Protect vegetation where high-water velocities are expected. For example, use a concrete splashblock at the rain gutter outlet and place large rough-edged stones at the outlet of any pipe.

Plant the Right Vegetation

Get the right kinds of plant varieties growing in the yard. When reestablishing vegetation, be certain that the soil, sunlight, drainage, and moisture are adequate.

Observe what plants are growing in similar situations and use them. There are many species that lend themselves to erosion control:

pachysandra	staghorn sumac
ground juniper	autumn olive
shore juniper	red--osier dogwood
crown vetch	bird's--foot trefoil
tall fescue	

Correct planting and good care will encourage quick establishment and cover.

REMEMBER

- Keep soil covered.
- Redirect water flow on slopes.
- Plant the right vegetation.
- Preventing erosion protects your soil and the Lakes.

For more information about *Great Lakes:Great Gardening* for both a better garden and a cleaner Lake, call or visit your local Cooperative Extension office.

Artwork by Susan Stone

Printed on recycled paper

Fact Sheet # 8

Great Lakes: Great Gardening

Soil Fertility

Protect the Soil

Soil is the essential foundation for all higher plants. Its fertility, pH (measure of acidity), moisture content, and physical qualities determine how well it will support plant life. Understanding and caring for the soil will produce a healthier, more productive garden.

The *Great Lakes Gardening* approach to soil fertility is to have your soil tested and apply fertilizers and limestone in the recommended amounts. By minimizing excess applications, your soil will sustain healthier plants, and any impact on water quality will be minimized.

Know Your Soil

Drainage

Drainage is the ability of water to flow through the soil. Water and dissolved chemicals move quickly through coarse - textured, sandy, or gravelly soil. Fine textured silt and clay soils and soils high in organic matter slow down the flow of water. These soil types provide sites to plant nutrients and other chemicals to adhere to.

Well - drained soils that are at least 2 ft. deep are the most suitable for all types of gardening. Soils with a high water table or those with a shallow hardpan layer will have more problems and may require site management and/or modification.

Fertility

Minerals necessary to support plant life are supplied from organic and inorganic sources. The complex chemical processes that supply plant nutrients are affected by the soil environment -- moisture, temperature, pH, and types of microorganisms present.

Improper application of fertilizer, including organic fertilizers, can result in loss of nutrients by surface runoff to nearby streams, lakes, rivers, or Lakes Erie and Ontario or by percolation into the groundwater.

Applying too much fertilizer can:
- waste money and time
- damage plant roots
- increase susceptibility to diseases
- encourage weed growth
- pollute surface and groundwater
- stimulate unwanted growth

To avoid overfertilization, have the soil tested through Cooperative Extension. Testing will give the level of primary plant nutrients and pH, recommended fertilizer rates to correct any deficiencies, and warn of excessive nutrient levels. It is important not to exceed the suggested rates.

Complete chemical fertilizers, containing nitrogen, phosphorus, and potassium or organic sources of plant nutrients (cottonseed and bone meal, manures, compost, etc.) are available and may be used to supply needed nutrients. Because the percentage of plant nutrients in most organic material is relatively low compared to chemical fertilizers, large amounts may be required to supply the needs of plants.

Properly timed annual or semi-annual applications of fertilizer are more beneficial to the plant's health and are less likely to cause environmental damage than infrequent heavy, ill-timed applications.

Woody plants, as a general rule, produce an abundance of roots in the spring as the soil warms. Depending on how stressful summer weather conditions are, additional root growth will occur in the fall as the soil cools. Contolled release -fertilizers can be applied in the spring or late fall if the soil has sufficient moisture. A fertilizer containing nitrogen in a slow - release form is usually recommended for fall fertilization. Avoid fertilizer application to dry soil and when soil temperatures are below 40 °F.

Trees and shrubs growing in or bordering a regularly fertilized lawn will usually not need separate applications of fertilizer. Plants not putting on adequate growth or having poor foliage color may be suffering from a disorder other than lack of nutrients. Always locate and remedy the primary cause before applying fertilizer to possibly aid in the plant's "road to recovery." Recently installed woody plants may respond to a fertilizer application if nutrient levels are low. Usually, phosphorus is lacking. In sandy soils, nitrogen may also be in short supply.

Avoid fertilizing woody plants from mid-June through September to avoid late flushes of tender growth that will not harden off properly before winter sets in. This tender growth could be injured or killed at low temperatures, providing entry for disease during the next growing season.

Nutrients that run off in the surface water will eventually reach Lakes Erie and Ontario. High nutrient levels may cause unnatural and sometimes disastrous algae blooms. Plant nutrients or chemicals leaching into the groundwater can contaminate drinking water for this and future generations.

Conditioning

Productivity and workability of the soil can be greatly improved by mixing in suitable decomposed organic matter. This will improve the water and the nutrient-holding ability of the soil, buffer temperature changes, and prevent rapid fluctuations in the pH. With increased microbial activity, the breakdown of many pesticides will be aided. Because of the chemical activity associated with organic matter, bonding sites in the soil matrix will be provided for some pesticides, thus preventing their movement into the groundwater.

REMEMBER

- Fertilize according to what the plant needs.
- Do not overfertilize.
- Time applications correctly.
- Add organic matter to improve soil structure.
- Healthy soil contributes to a healthy environment.

For more information about *Great Lakes:Great Gardening* for both a better garden and a cleaner Lake, call or visit your local Cooperative Extension office.

Arwork by Susan Stone

Printed on recycled paper.

BEST COPY AVAILABLE

Great Lakes: Great Gardening

Fact Sheet # 9

Pest Management

Pests are organisms that harm our gardens and landscapes. Many people think of insects when they think of pests, but fungi, bacteria, viruses, weeds, rodents and other animals can be as troublesome. They compete with us for food, injure plants and are a general annoyance. Pests can be controlled without damaging the environment, but gardeners needs to become observant, knowledgeable, and patient.

A totally pest-free garden, though seemingly desirable, is expensive and unattainable. In fact, a small pest population is helpful in attracting and maintaining a population of natural predators.

When pests must be controlled, the integrated pest management (IPM) approach is the ecologically sound choice. Seek the solution with the least harmful impact.

IPM Steps

- determination of tolerable weed or pest level
- prevention
- accurate identification of the pest
- selection of the most accurate treatment (timing, quantity, frequency, targets), that offers the least toxicity.

Know the Garden

Do you know what is going on in your garden? Inspect the plants for insect and disease damage -- including the underside of leaves -- at night as well as daytime. Observe the behavior of insects and use reference books or Cooperative Extension literature to identify the insects present, remembering that most are beneficial and many are your helpful predators. Beneficial insects include ladybugs, spiders, bees, wasps, praying mantises, and many beetles and flies.

When you use pesticides, you are probably killing beneficial insects along with your target pests, so such choices should be made only when the insects have been identified.

When you do identify a pest problem, the first question is not *what* to spray. Rather, ask whether the pest is really a problem. If needed, use the least toxic method of control, that is, pull the weed, remove the diseased leaf, or squash the harmful insect. Sometimes natural predators will discover the pest. The more often garden chemicals are used, the greater the risk of endangering human health and the environment.

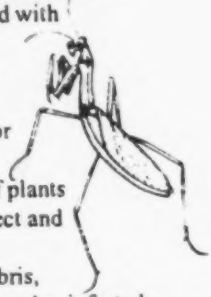
By looking at the pest problem realistically, it is possible to:

- Save money by buying fewer pesticides
- Save time by addressing only what needs to be controlled
- Save the Great Lakes and other water bodies by introducing fewer chemicals into the environment.

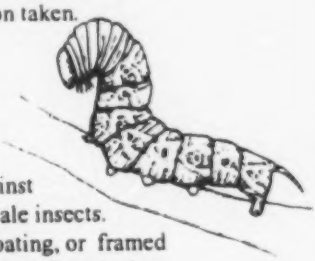
Wise Gardening Prevents Problems

Make the garden a healthy place for preferred plants and an undesirable place for pests by:

- Selecting appropriate species or varieties that are insect - and/or disease - resistant.
- Providing proper moisture levels to maintain healthy plants and thus conserve water.
- Maintaining proper fertility and pH levels by having the soil tested and applying only the nutrients needed. Soil amended with compost or other types of organic matter will help with fertilizer and water retention, as well as providing a home for beneficial earthworms.



- Rotating the various groups of plants where practical, to reduce insect and disease problems.
- Keeping the garden free of debris, particularly dead plants that may be infested, and weeds unless they are part of the plan for maintaining beneficial insects.
- Timing plantings to avoid known insects/pests.
- Encouraging the build-up of beneficial insects and mites. (Beneficial insects need water, food, and shelter, so provide appropriate flowers and herbs in your garden so that the helpers are around when pests arrive.)
- Properly identifying the problem before control measures are activated.
- Estimating potential damage and deciding it is necessary to control insects and mites. If given a chance, perhaps natural predators will take over.
- Selecting the least toxic, or least chemical approach to control the problem.
- Recording the results of action taken. A decision not to spray is an action taken.



Non-Toxic Control Methods

Insects

- Prune heavily infested parts of the plant. This method is used against localized infestations of the scale insects.
- Cover crops with screening, floating, or framed row covers, etc., to prevent insects from laying eggs or migrating from nearby areas. The covers must be removed when insect - pollinated crops come into flower.
- Use insect traps where appropriate, such as the red sticky trap for apple maggot, or the sticky yellow cards to measure or catch whitefies or some gnats and aphids.
- Remove insects and mites with a spray of water.
- Handpick insects, slugs, and squash egg masses.
- Use companion planting combinations that control insect pests by repelling, confusing, or attracting beneficial insects, and avoid monocropping.

Diseases

- Plant disease-resistant varieties.
- Rotate annual and vegetable plants where practical, and avoid using plants especially prone to disease attacks.
- Space plants to improve air circulation.
- Time overhead irrigation early in the day to allow the foliage to dry before nightfall.
- Prune out diseased plant parts to avoid infecting other plants. Discard badly diseased plants.
- Be meticulous about fall clean-up, and do not compost or mulch diseased debris.

Slugs

- Use shallow containers of beer or yeast solution to monitor for slugs.
- Provide hiding places (overturned pots, citrus or melon rinds, boards, burlap). Check them frequently and kill slugs.

Weeds

- Use mulches to prevent weed germination.
- Hand weed and/or cultivate weekly.
- Till properly to minimize stirring up weed seeds (unless you maintain a permanently mulched,

no-till bed). In fall, till twice, first at 7 in. and two weeks later at 2 in. in spring, till twice, at 2 in., the last time just at planting.
- Use cover crops or intercropping to block weeds.

Pesticides

Pesticides (insecticides, miticides, herbicides, etc.) are chemicals used to control pests. If used improperly, they can have an impact beyond their intended target. The continual accumulation and combination of small amounts of toxic substances can create problems. If misused, small quantities of toxic chemicals can disrupt the environment. Even botanical pesticides can kill beneficial insects.

A pest population can become resistant to pesticides when only one or two products are used repeatedly against a specific pest. Pesticides should be the last defense to control a pest.

The *Great Lakes Gardening* strategy is to use alternative pest control methods, build up the natural predator population, reduce the amount of chemicals introduced into the environment, to apply the product properly only when needed, and to keep pesticides in the target area.

If Pesticides Are Used!

Chemical controls should be applied only when the pest is present or if weather conditions are favorable for the outbreak of a regularly occurring disease (scab on an apple). Spraying should not be set by the calendar. Schedule treatments to be most effective and least disruptive to naturally existing pest predators (i.e., before dawn or after dusk to protect bees).

Choose the Right Chemical

Seek good advice when in doubt about a problem. Choose the least toxic alternative: pyrethrins, insecticidal soap, horticultural oils, rotenone, and the biologicals, *Bacillus thuringiensis* (B.t.). Buy only what you need for one season. Some pest control products lose their effectiveness while sitting on the shelf. Some will also require specific storage conditions. Reread the label each time you use the pesticide. Make sure the pest and plant or site is listed. Labels change and newer restrictions could have been added.

Mix Correctly

Do not guess when mixing. Measure and follow the label recommendations carefully, mixing only the amount that you will use that day. Chemicals can damage plants, harm people and the environment.

Be Prepared for Spills

Clean up spills right away. Your chemical storage area should have a non-porous floor to facilitate cleaning spills. It should not have a drain. Set up a barrier, such as cat litter, to contain the spills. Do not flush spilled material down a drain. Carefully sweep up spilled powders and dusts. Scrub wood, cement or tile surfaces with a small amount of water and activated charcoal. Place all contaminated material in a plastic bag, seal, and dispose of properly at a household hazardous waste collection facility.

Apply Chemicals Properly

Read and follow all safety precautions on the label. Do not apply pesticides when:
- it is windy or raining
- there is a possibility they will enter a stream lake or drain,
- the temperatures are above 85°F.

Dispose of Leftover Pesticide Concentrate

Use the pesticides as directed on the label. Record how much was actually needed for future reference. Do not pour unused portions down a drain, for they could flow into the Lakes. If the pesticide is no longer effective or wanted, call the town for information on household hazardous waste disposal programs in your area. Triple - rinse empty containers and use the rinse water for the spray.

Store Properly and Safely

Store all pesticides in their original, labeled containers. Keep them on secure, strong shelves in a locked cabinet away from heat and moisture. Always keep them away from children, pets, and irresponsible adults.

For more information on pest management, IPM, mulches, green manures, beneficial insects, or the Organic Choices fact sheets (Erie County) contact your local Cooperative Extension office.

REMEMBER

- Pest control choices can impact water quality.
- Good garden management is the best means of controlling pests.
- Most insects are not harmful, many are beneficial predators, so using pesticides may kill your best ally.

Artwork by Susan Stone

Printed on recycled paper

Great Lakes: Great Gardening

Fact Sheet # 10

Landscaping

Development on open land and in wooded areas has increased the area covered by buildings, paved surfaces and turf. This development causes increased runoff that carries contaminants. This phenomenon occurs more rapidly after a storm. Storm sewers carry most runoff untreated into surface or groundwaters, where it poses a serious threat to our water quality. Gardeners can help alleviate the runoff problems by reducing the volume of water leaving their property.

Water Flow

Start by watching the pattern of water flow on and around the garden and lawn. Does overflow run off in a heavy rain, carrying soil with it, exposing plant roots? Does the water penetrate to plant roots when watering, or does it run uselessly down the sidewalk, driveway or alley and into the storm drains?

Making Landscape Choices

Your landscape choices can improve the beauty of the garden and the water quality of streams, rivers, bays, the Great Lakes, and groundwater. Properly selected plants or landscaping features can reduce runoff and minimize the amount of pesticides and fertilizers applied to lawns and gardens. Plant selection, turf areas, types of walks and decks, and control of water infiltration and flow, affect water quality in the Lakes.

Plant Selection

All plants have their own special requirements in terms of sunlight, moisture, temperature range, soil type, and fertility needs. A plant living in less than optimum conditions will not be as healthy as it could be under ideal conditions.

Selecting plants with needs that match what the site can provide will minimize maintenance, enhance plant health and reduce the need for fertilizers and pesticides.

Turf Choices

Turf can remain an integral part of the landscape without being a heavy user of water, fertilizer, and pesticides. Good quality turf *can* be maintained with limited use of chemicals. When a new lawn or renovation is planned, select turfgrass types and varieties that are low maintenance and disease-resistant. (Cooperative Extension can provide you with a list). It is not wise to grow grass:

- in dense shade with shallow tree roots
- where maintenance is difficult (under low branches, on steep hillsides, etc.)
- where intensive traffic tramples all vegetation and compacts the soil.

> The *Great Lakes Gardening* strategy to landscaping is to plant low maintenance, disease-resistant species and varieties and follow xeriscaping principles.

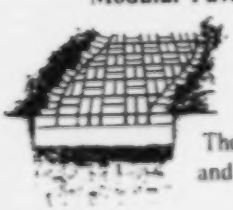
If you decide to reduce the area devoted to lawns, use ground covers such as ivy or pachysandra, shrubbery borders and trees. These types of plants help to:

- give an increased sense of space
- reduce home heating and cooling costs by blocking the cold winds of winter and providing shade in the summer
- encourage birds, many of which are natural predators of bothersome insects, by providing nesting sites and creating wildlife habitat
- reduce the use of chemicals; properly selected and planted woody plants generally require less chemical applications
- reduce the amount of water needed
- allow for more time to enjoy the garden, as less time must be spent maintaining it.

Selecting Walkways

Concrete and asphalt seal the land, eliminating infiltration, causing runoff in areas that could otherwise soak up the water. Following are some paving surfaces that can offer permeability as well as durability.

Modular Pavers



In moderate traffic areas where turfgrass is desired, modular pavers can be used. This category includes stone, brick, and lattice paving blocks. They can be used on any well-drained soils and must be placed on a base of crushed stone or sand. To further camouflage these blocks, soil can be placed in open spaces between bricks and grass weeds sown. Maintenance is similar to rest of the lawn.

Wood Decking

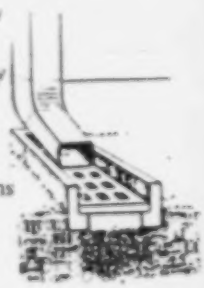
A low deck, with a 2 in. x 6 in. board surface, serves as an attractive and functional ground surface. Heights can vary to make a yard more interesting and to suit the terrain. Properly designed decking constructed with appropriate material (either cedar, redwood, or treated wood) will last a long time. Spaces between the boards allow for the easy infiltration of rainwater. Decks generally shade out most weed growth. One-half in. to 3/4 in. pea gravel, 2 in. to 3 in. deep will allow for infiltration of water reduce erosion under the deck.

Stone or Gravel

These can make an attractive surface. Be sure to use porous sheeting underneath to help stabilize gravel and to control weeds while permitting water infiltration.

Controlling Runoff

Think about the ultimate destination of rainwater. Runoff from roofs and paved surfaces can be deflected onto and spread over well drained soil where infiltration occurs. Encourage retention and infiltration by:



- using gravel or modular pavers installed in low lying areas where runoff may be detained, allowing it to infiltrate the soil more efficiently
- using gravel seepage pits, a Dutch Drain or a series of infiltration beds underlain by either a gravel or tile drainage system
- using gravel trenches or french or curtain drains along driveways and pathways
- terracing
- directing runoff across vegetated surfaces -- resodding bare patches in the lawn.

For more information on *Great Lakes Gardening*, contact your local Cooperative Extension office.

REMEMBER

- Design the yard to suit your needs and protect water quality.
- High quality turfgrass can be maintained using limited chemical inputs.
- Keep rainfall and irrigation water on your yard.
- Use permeable paving materials
- Choose low water use plants.

Artwork by Susan Stone
Printed on recycled paper

Fact Sheet # 11

Great Lakes: Great Gardening

Attracting Birds Naturally

Good for the Birds: Good for You

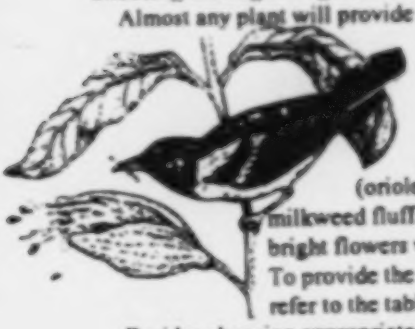
Attracting birds to your backyard is usually considered just an enjoyable pastime. But did you know that there are other benefits? They reduce populations of insects that attack flowers, lawns, gardens, and people. The idea of attracting birds usually brings to mind images of bird feeders, birdhouses, and birdbaths. But there is another more natural way of attracting birds: landscaping with plants that are desirable to birds. Birds are attracted to plants that provide food and cover, a nesting place, or a refuge from predators. As natural habitats are destroyed and bird populations decline, it becomes increasingly imperative for individual citizens to create miniature bird sanctuaries in their backyards.

Variety is the Spice of Life

Birds normally feed on brightly colored berries, seeds of all sorts (including the seeds of pine cones and other conifers), insects, and in some cases, nectar. Birds enjoy variety, so keep this in mind when landscaping. Use a full range of plant material including flowers, grasses, vines, trees and shrubs, both deciduous and evergreen. Vary the sizes, shapes, and species of your selections. You will likely find yourself enjoying the variety as much as the birds do.

Choosing the Right Vegetation

Almost any plant will provide some benefit to birds, whether it be seeds or berries, thick underbrush for protection, soft material for nesting (orioles often weave milkweed fluff into their nests), or bright flowers which attract insects. To provide the most beneficial plants, refer to the table below.



Besides choosing appropriate plants, there are some general guidelines to follow:

- Plant shrubs and hedges densly in order to provide adequate cover (a tangled thicket is heaven to a bird family).
- Avoid overpruning, as this will decrease the number of buds, seeds, and berries available to birds.
- If you have a dead tree, consider keeping it if it is not endangering property or health, since it provides excellent nesting sites.
- Avoid using insecticides, as they can be fatal to birds.

Another aspect of gardening for birds which cannot be ignored is to provide a source of water. Since most gardens do not come equipped with a pond or running stream, reasonable substitutions can be easily made. The simple pedestal birdbath with which we are all familiar actually does an admirable job. But be sure it is not filled too deeply (one or two inches will do), since birds prefer not to venture much beyond ankle depth. It is also important also to realize that song birds are particularly attracted to the sound of water; a mere trickling or even dripping is quite adequate.

One other factor to consider is that many birds are uncomfortable in large open lawn spaces. So if you've been considering shrinking your lawn in order to decrease your mowing time and effort, you could easily rationalize that you're doing it for the birds!

Artwork by Susan Stone

PLANTS FOR ATTRACTING BIRDS

Trees	
Acer rubrum	red maple
Carya spp.	hickories
Celtis spp.	hackberries
Cornus florida	flowering dogwood
Diospyros virginiana	common persimmon
Elaeagnus angustifolia	Russian olive
Fagus grandifolia	American beech
Fraxinus americana	white ash
Ilex opaca	American holly
Juniperus scopulorum	Rocky Mountain juniper
Juniperus virginiana	eastern red cedar
Malus spp.	crab apples, apples
Morus alba	white mulberry
Nyssa sylvatica	black tupelo
Olneya tesota	ironwood
Pinus strobus	eastern white pine
Platanus wrightii	sycamore
Populus tremuloides	quaking aspen
Prunus serotina	wild black cherry
Prunus virginiana	chokecherry
Pseudotsuga menzesii	Douglas fir
Quercus alba	white oak
Quercus palustris	pin oak
Quercus rubra	red oak
Tsuga canadensis	Canada hemlock
Shrubs	
Amelanchier spp.	serviceberries
Buddleia davidii	orange-eye bush
Cornus sericea	red osier dogwood
Ilex verticillata	winterberry
Myrica spp.	bayberries
Prunus maritima	beach plum
Rhododendron catawbiense	catawba rhododendron
Ribes spp.	currants
Rubus spp.	blackberries, raspberries
Sambucus canadensis	American elder
Vaccinium spp.	blueberries
Viburnum dentatum	arrowwood viburnum
Viburnum trilobum	American cranberry bush viburnum
Flowers	
Antirrhinum majus	common snapdragon
Campsis radicans	trumpet vine
Fuchsia x hybrida	fuchsia
Heuchera sanguinea	daylily
Lilium spp.	lilies
Monarda didyma	bee balm
Phlox paniculata	garden phlox
Tropaeolum majus	nasturtium

Printed on recycled paper

BEST COPY AVAILABLE

Great Lakes: Great Gardening

Fact Sheet # 12

Lawns

If You Have a Yard, You Probably Have a Lawn

Most lawns do not have to be meticulously managed to be healthy and look good. Selecting the right species and varieties, fertilizing one to three times per year, proper mowing and thatch management, and timely summer watering contribute to keeping the lawn healthy.

Some gardeners, in an attempt to achieve a perfect lawn, may use unnecessary or excessive amounts of fertilizers, water, and pesticides. Overfertilization is a waste of money and may pose a hazard to the environment. Many of the newer grass varieties retain good green color with reduced amounts of fertilizer and, in many cases, less water.

A healthy, dense lawn will help reduce weed invasion and is the best defense against pesticide and fertilizer runoff into the Lakes.

The *Great Lakes Gardening* approach to lawns is to use insect - disease - and drought - tolerant grasses that require fewer chemicals, thereby reducing the risk of environmental damage.

The basic lawn-care principles include:

- Managing lawns properly to minimize the need for pesticides.
- Avoiding the use of fertilizer.
- Using slow-release fertilizers.
- Following the pesticide label instructions and precautions.
- Considering low-care alternatives to turfgrass, such as ground covers, herbs, meadows, or paths.
- Evaluating lawn priorities: "How important is a totally weed-free lawn and what price am I willing to pay for it?"
- Using grasses with known tolerance to insects, disease, low fertility, and drought. Examples of drought-tolerant grasses include:

Kentucky bluegrasses (Bristol and Challenger), and perennial ryegrasses (All Star, Pennfine, and Premier). Some Kentucky Blues that tolerate poor fertility include Fylking, Merit, and Ram I. Fine fescues also perform well under low-maintenance conditions.

Some perennial ryegrasses contain beneficial fungi (endophytic fungi) which render these varieties resistant to certain turf insects such as chinch bugs and sod worms.

(For a complete list of grasses and their tolerances to insects, diseases, drought, and various other conditions, you may request *Cornell Turfgrass Cultivar Recommendations for* 1993, by Norm Hummel.)

Factors to Consider for a Healthy Lawn

Establishment

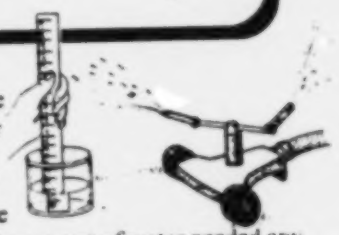
Planting recommended species and varieties for your area will go a long way toward preventing problems. A good blend for low maintenance lawns includes: (a) Sunny location: 65% fine fescue, 20% perennial rye, and 15% Kentucky Bluegrass, or (b) Shady location: 33% perennial rye, 33% fine fescue, and 33% Kentucky Bluegrass.

Fertility

Maintain the proper level of soil fertility and avoid overfertilization by following soil test recommendations. It is best to use slow-release types of nitrogen. Do not apply more than one pound of actual nitrogen per 1,000 sq. ft. at one time. To determine what one pound of actual nitrogen is, divide the first number on the fertilizer bag into 100. The result is the amount (in pounds) you should take out of the bag and apply over 1,000 sq. ft. of lawn. The number of applications of fertilizer per year is best determined by turf type. Where fine or tall fescue-type grasses predominate,one or two applications are suggested. The bluegrasses generally require three applications. Recommended application times coincide with three different holiday periods: Memorial Day, Labor Day and Thanksgiving (quick-release only at Thanksgiving).

Amount of Fertilizer to Use
(each application on established lawns)

% Total Nitrogen Fertilizer/1000 sq. ft.	Lbs. (as on label)
4	25
5	20
6	17
7	14
8	12 1/2
9	11
10	10
20	5



Water

Most lawns require one inch of water per week, either in the form of irrigation or natural rainfall. Some factors influencing the amount of water needed are: grass and soil type, amount of rainfall, relative humidity, and wind speed. Deep, infrequent watering is much better than daily, shallow watering, except in the case of a newly established planting.

Soil pH

Have a soil pH test done to determine if pH should be corrected. Proper pH, 6.2 to 6.5, can enhance the grass's ability to take up valuable fertilizer, tolerate drought conditions, and resist diseases. Limestone or sulfur (to raise or lower pH as needed) can be applied at any time of the year when the ground is not frozen, preferably in fall. Changing the pH takes time--perhaps more than one season -- but can easily be done, and advice or testing is readily available at most Cooperative Extension offices.

Mowing

Mow the lawn throughout the growing season at the recommended height for the species of turfgrass growing, selecting the tallest acceptable mowing height to shade weeds and retain soil moisture. Mowing frequency is determined by the temperature and the

amounts of water and fertilizer applied to the lawn. The more fertilizer applied, the more frequently the lawn will have to be mowed.

It is best not to remove more than one-third of the grass plant at any one time. Clippings can be left where they fall if they are less than one inch in length. This will reduce the amount of fertilizer needed by 25%, since turfgrass clippings contain nutrients that are released back to the soil. If clippings are too long, add them to the compost pile. Mower blades should be sharp as dull blades fray grass tips, giving the lawn a whitish-brown appearance.

Soil Compaction

Some areas in our region have clay soil or soil that has been poorly managed or compacted, thus creating a hardened, poorly aerated and drained soil. Some homeowners aerate this type of soil (in spring or fall), to allow oxygen and water to get to the grass roots. Wearing golf shoes or other shoes with aerating spikes can help. If the compacted soil layer is more than three to four inches thick, aeration is of little value because most aerifiers do not penetrate below four inches. Even better than aeration techniques is changing the soil structure by adding organic matter, whether compost, manure, or other shredded material. This improves the oxygen-holding and water-retention ability of the soil and attracts earthworms, which aerate and fertilize.

Thatch

Thatch is the dense mat of tangled roots and stems, just above soil level, that form when grass roots cannot penetrate the soil. This happens when the lawn is overfertilized and grass roots do not penetrate deep into the soil in search of nutrients. Heavy thatch restricts water movement into soil. Some species, such as the fine fescues and Kentucky bluegrasses produce thatch; while others such as tall fescues and perennial ryegrasses do not. Thatch can be prevented by healthy lawn practices, including fertilizing properly, using slow nitrogen-releasing or organic fertilizers, and improving soil with organic material (to attract earthworms, which chew up thatch). De-thatching is recommended for lawns with 1/2 in. or more of thatch and should be done in the fall. It is wise to use a de-thatching machine with fixed blades rather than a machine with blades that flip back and forth because the latter will not reduce the underlying thatch layer and will damage the lawn. To deal with thatch, soil cores can be broken and spread on the lawn. If thatch is over 1 1/2 in. thick, total renovation is recommended.

Insect, Disease and Weed Control

The best tool for pest management is to plant grass varieties that tolerate the region's growing conditions and have the greatest resistance to insects and diseases. If you have a problem, take time to accurately identify the problem, potential damage, and best solution. Avoid applying pesticides according to predetermined calendar schedules--unless you have the problem each year and a pesticide application is the only means of control (such as for turf grubs). Begin checking for these insects in April. Insecticides should be used only when the number of pests is high (i.e., 5 grubs per sq. ft. of healthy lawn). When treatments are necessary, they should be chosen and timed to be the most effective in dealing with the specific pest and the least disruptive to natural controls.

REMEMBER

- A dense, healthy lawn is the best defense against weed invasion.
- There are turfgrass varieties available to decrease your lawn care requirements.
- Look for alternatives to lawn in some areas of the yard. It will mean less work, a more interesting yard and a cleaner Great Lakes.

For more information about *lawn care without pesticides* for both a better yard and a cleaner Lake, call or visit your local Cooperative Extension office.

Artwork by Susan Stone

Printed on recycled paper.

Cornell Cooperative Extensions in the Lake Ontario Lake Erie Drainage Basin

Allegany
County Rd. 48, RD 1, Box 226
Belmont, NY 14813

Cattaraugus
RR 2 Box 16A
Ellicottville, NY 14731-0870

Cayuga
P.O. Box 617, 248 Grant Ave.
Auburn, NY 13021-0617

Chautauqua
3542 Turner Rd.
Jamestown, NY 14701-9608

Erie
21 South Grove St.
East Aurora, NY 14052-2398

Franklin
63 West Main St.
Malone, NY 12953

Genesee
420 Main St.
Batavia, NY 14020-2599

Hamilton
P.O. Box 207, NYS Rte. 8
The White House
Lake Pleasant, NY 12108

Orleans
NYS Rte. 5
RR 1 Box 234 C
Herkimer, NY 13350-9721

Jefferson
Empsall Plaza, 223 J.B. Wise Place
Watertown, NY 13601-2597

Lewis
P.O. Box 72, Outer Stowe St.
Lowville, NY 13367

Livingston
158 South Main St.
Mount Morris, NY 14510-1595

Madison
P.O. Box T, Eaton St.
Morrisville, NY 13408-0640

Monroe
249 Highland Ave.
Rochester, NY 14620

Niagara
4487 Lake Ave., Rural-Urban Ctr.
Lockport, NY 14094

Oneida
126 Second St.
Oriskany, NY 13424-0748

Onondaga
1050 West Genesee St.
Syracuse, NY 13204

Ontario
480 North Main St.
Canandaigua, NY 14424-1099

Herkimer

P.O. Box 150, 20 South Main St.
Albion, NY 14411-0150

Oswego
5869 Main St.
Mexico, NY 13114

St. Lawrence
University Shopping Ctr.
125 Main St. East,
Canton, NY 13617

Schuyler
208 Broadway
Montour Falls, NY 14865

Seneca
321 East Williams St.
Waterloo, NY 13165

Tompkins
615 Willow Ave.
Ithaca, NY 14850-3555

Wayne
1581 Rte. 88N
Newark, NY 14513

Wyoming
401 North Main St.
Warsaw, NY 14569

Yates
County Office Building
110 Court St.
Penn Yan, NY 14527

New York Sea Grant

Hartwell Hall
SUNY College at Brockport
Brockport, NY 14420-2928

21 South Grove St.
East Aurora, NY 14052-2398

Swetman Hall
SUNY College at Oswego
Oswego, NY 13126-3599

Fernow Hall
Cornell University
Ithaca, NY 14853-3001